



This is just ONE way to go about finding a relationship between the radius of the circle and the area of the shaded region.

Recall, AC is held constant.

The lengths of CE and CD are

$$\sqrt{AC^2 - r^2}$$

The length of arc ED is

$$2\pi r \frac{\angle EAD}{2\pi} = r \cdot \angle EAD = r \cdot 2 \cdot \angle EAC$$

The measure of angle EAC is, in terms of the givens in the problem, is  $\arccos\left(\frac{r}{AC}\right)$ .

Therefore, the length of the arc is  $2 \cdot r \cdot \arccos\left(\frac{r}{AC}\right)$ .

The perimeter of the region is  $2 \cdot r \cdot \arccos\left(\frac{r}{AC}\right) + 2 \cdot \sqrt{AC^2 - r^2}$